a height of 24 mm to 30 mm. The preferable curve C2 is a little smaller, and it may have a height of 22 mm or less. It is preferable to use a fingertip representation size D of an adult of the country where the present input device will be used.

[0059] To learn to operate the input device, a user moves the center of an effective fingertip, such as an index finger, to the home position on projection **15**. The user then moves this fingertip within its limits in all directions, imagining the array of keys as shown in **FIG. 5B**. The user then explores and presses projections **11-14** and projection s **16-22**. A new user can become proficient and precise with this input device with relatively little training.

[0060] A block diagram of a Personal Digital Assistant **2** using this invention is shown in **FIG. 9**. Components **1'** required for input operations are outlined. An antenna **30** is mounted on the case. A radio transceiver **31** processes radio signals transmitted and received by the antenna. A voice circuit **32** includes a MIDI function and a phonetic function. A loudspeaker **33** provides audio output. A microphone **34** provides voice input. A display screen **3** such as an LCD panel is provided. A display control means **35** displays various information such as telephone numbers on the display screen. The display control means **35** also displays the input when the present fingertip tactile sense input device is used. A control section **36** controls the PDA as a whole. A memory **37** stores various programs and data, which are loaded into a control section **36**. An input control means **38** encodes the input signal from the fingertip tactile sense input device **1**, and sends it to the control section.

[0061] With this input device, a fingertip is only slightly moved on the input plate. Therefore, a user may press two projections simultaneously. The strongest input signal is selected by a selection section **39**. It identifies the projection that is pressed most strongly by comparing the amount of current it receives from among the contacts of projections **11-22** that have moved above a voltage threshold. It latches the strongest input and passes an identification signal to the input control means. It cancels when it cannot choose.

[0062] In response, the input control means **38** encodes a data representation of the projection producing the selected input signal. This can be an alphanumeric character in ASCII or JIS code or the like that is passed to the display by the control section **36**. If the user accepts the displayed character, he or she can push the same projection again to confirm. Otherwise, the user pushes a different projection to correct. An input will automatically confirm after a predetermined time elapses without a change. Thus, the display is used to visually check the input as it occurs. Preferably an audible check of input is also offered by means of the voice circuit and loudspeaker.

[0063] The present fingertip tactile sense input device can be used not only for a Personal Digital Assistant but also for other information terminals and electronic equipment. The size of a key button is extremely reducible by providing means such as described herein to check the input.

[0064] Function keys can be provided in addition to the basic input projections. **FIG. 10A** shows an arrangement of input projections **11-22** and additional keys **41-43**. The input projections are spaced 7.0 mm laterally and 6.5 mm vertically. A navigation key **41** is used to choose an item from a displayed menu. It is located on curve C1 at top center. Function keys **42** and **43** are used to direct various functions. They are arranged on curve C1, equidistantly left and right from the home projection **15** and ½ pitch above it. The navigation and function keys may be larger than the basic projection keys as in **FIGS. 10A and 10B**, or they may be arranged like a conventional key button structure **122** of **FIG. 12**.

[0065] **FIG. 10B** shows a similar arrangement with smaller spacing of input projections. The input projections are spaced 6.0 mm laterally and 5.4 mm vertically. The navigation key **41** is located just within C1 and centered above the projections.

[0066] To minimize fingertip movement, the navigation key **41** and function keys **42-43** can be positioned within curve C2. However, this brings the additional keys close to the basic input projections. Therefore, it is desirable to locate less frequently used keys, such as the navigation key, in the area between curves C1 and C1. This provides fingertip access to them yet spaces them from the basic input projections.

[0067] When the spacing between projections is larger, as in **FIG. 10**A, it is easier to recognize individual projections by touch, but the required movement of the fingertip is larger. When the spacing between projections is smaller, as in **FIG. 10**B, recognition of individual projection by touch is harder, but operability is better because a fingertip can move more surely within a smaller range.

[0068] Although the present invention has been described herein with respect to preferred embodiments, it will be understood that the foregoing description is intended to be illustrative, not restrictive. Modifications of the present invention will occur to those skilled in the art. All such modifications that fall within the scope of the appended claims are intended to be within the scope and spirit of the present invention.

I claim:

1. A fingertip tactile sense input device comprising:

an input plate with a plurality of projections, each projection having a front end for receiving pressure contact by a human fingertip, and each projection having a back end;

the projections arranged in a surface area with a generally egg-shaped outline defined by the range of motion on a surface by a human fingertip with the wrist fixed, and that is equally usable with a right or left hand; and

input control means that encodes a given input signal when a respective one of the projections is pressed by a moving fingertip.

2. The fingertip tactile sense input device of claim 1, wherein at least twelve projections are provided within the egg-shaped outline, corresponding to digits 0-9 and characters "*"and "#".

3. The fingertip tactile sense input device of claim 2, wherein the at least twelve projections are arrayed in rows and columns, with lateral spacing of the columns in a range of 4.5 mm to 8.0 mm, and vertical spacing of the rows in the range of 4.0 mm to 7.0 mm.